

What we know...

How to determine the VERTEX by FACTORING and using the zeros
How to determine the VERTEX by COMPLETING the SQUARE

Students will learn;

How to Solve WORD Problems that require the VERTEX (the MAX or MIN point)

Complete the Square

a) $y = 3x^2 + 12x - 16$

b) $y = 2x^2 + 10x - 16$

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Complete the Square

a) $y = 3x^2 + 12x - 16$

$$y = 3(x^2 + 4x) - 16$$

$$y = 3\left(x^2 + 4x + 4 - 4\right) - 16$$

$$y = 3\left[(x+2)^2 - 4\right] - 16$$

$$y = 3(x+2)^2 - 12 - 16$$

$$y = 3(x+2)^2 - 28$$

b) $y = 2x^2 + 10x - 16$

$$y = 2\left(x^2 + 5x\right) - 16$$

$$y = 2\left(x^2 + 5x + \frac{25}{4} - \frac{25}{4}\right) - 16$$

$$y = 2\left(x + \frac{5}{2}\right)^2 - \frac{25}{2} - 16$$

$$y = 2\left(x + \frac{5}{2}\right)^2 - \frac{50}{2} - \frac{32}{2}$$

$$y = 2\left(x + \frac{5}{2}\right)^2 - \frac{82}{2}$$

$$y = 2\left(x + \frac{5}{2}\right)^2 - 41$$

Vertex: $\left(-\frac{5}{2}, -41\right)$ $\left(-2.5, -20.5\right)$

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(6.3) Max/Min Word Problems

To solve max/min word problems:

- 1) Identify the quantity to be maximized or minimized.
- 2) Complete the square.
- 3) Read off the values of a and k:
If $a > 0$ then k is a Maximum
If $a < 0$ then k is a Minimum

(h, k)

Example 1: A frisbee is thrown and the height above the ground, h , in metres is given by $h = -t^2 + 8t + 1$, where t is the time in seconds.

a) Find the maximum height of the frisbee.

$$h = -t^2 + 8t + 1$$

$$h = -(t^2 - 8t) + 1$$

$$h = -\left(t^2 - 8t + 16 - 16\right) + 1$$

$$h = -\left[(t-4)^2 - 16\right] + 1$$

$$h = -(t-4)^2 + 16 + 1$$

$$h = -(t-4)^2 + 17$$

$$y = (x-h)^2 + k$$

$$(4, 17)$$

At 4 seconds the frisbee reaches a max height of 17m.

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If $a > 0$ then k is a _____
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(6.3) Max/Min Word Problems

To solve max/min word problems:

- 1) Identify the quantity to be maximized or minimized.
- 2) Complete the square.
- 3) Read off the values of a and k:
If $a > 0$ then k is a min
If $a < 0$ then k is a max

Example 1: A frisbee is thrown and the height above the ground, h , in metres is given by $h = -t^2 + 8t + 1$, where t is the time in seconds.

a) Find the maximum height of the frisbee.

$$h = -t^2 + 8t + 1$$

$$h = -(t^2 - 8t) + 1$$

$$h = -\left(t^2 - 8t + 16 - 16\right) + 1$$

$$h = -\left[(t-4)^2 - 16\right] + 1$$

$$h = -(t-4)^2 + 16 + 1$$

$$h = -(t-4)^2 + 17$$

The max height of the frisbee is 17m at 4 sec.

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b) How long does it take the frisbee to reach its maximum height?

c) How long before the frisbee hits the ground? (To one decimal place.)

d) How high is the frisbee above the ground before it is thrown?

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b) How long does it take the frisbee to reach its maximum height?

c) How long before the frisbee hits the ground? (To one decimal place.)

$$h = -t^2 + 8t + 1$$

$$h = -[t^2 - 8t - 1] \quad \begin{matrix} \text{A/M} \\ -3 \end{matrix}$$

non factorable

d) How high is the frisbee above the ground before it is thrown?

$$t = 0$$

4m

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Example 2: Mrs. Owens' back yard is enclosed by fencing. The area of the yard, A , in square metres, is given by $A = 200w - 2w^2$ where w is the width in metres.

a) What is the width of her yard if the area is maximized?

b) What is the maximum area of Mrs. Owens' back yard?

c) What are the dimensions of the yard?

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Example 2: Mrs. Owens' back yard is enclosed by fencing. The area of the yard, A , in square metres, is given by $A = 200w - 2w^2$ where w is the width in metres.

a) What is the width of her yard if the area is maximized?

$$A = 200w - 2w^2 \quad (100/2)^2$$

$$A = -2w^2 + 200w \quad 2500$$

$$A = -2(w^2 - 100w)$$

$$A = -2(w^2 - 100w + 2500 - 2500)$$

$$A = -2(w - 50)^2 + 5000 \quad (h, k) \quad (50, 5000)$$

$$A = -2(w - 50)^2 + 5000$$

b) What is the maximum area of Mrs. Owens' back yard?

If the width is 50m she will have a maximum area of 5000m²

c) What are the dimensions of the yard?

$$\begin{matrix} 100 \\ 5000m^2 \end{matrix} \quad 50$$

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Homework

Pg. 331 # 8, 9, 10
& Handout

May 12-7:33 AM

Attachments

Lesson 3 - 6.3 Word Problems.docx